

FISCAL YEAR 2022 END-OF-YEAR REVIEW  
SEPTEMBER 1, 2021 to AUGUST 31, 2022  
LOUISIANA DEPARTMENT OF NATURAL RESOURCES (LDNR)  
OFFICE OF CONSERVATION  
UNDERGROUND INJECTION CONTROL (UIC) PROGRAM

EXECUTIVE SUMMARY

This oversight report details the significant accomplishments of Louisiana's Office of Conservation (OC) Injection Mining Division (IMD) in meeting the state fiscal year 2021 (FY22) UIC grant workplan commitments between September 1, 2021, and August 31, 2022 (note: EPA FY22 was Oct. 1, 2021-Sept. 30, 2022). EPA oversight discussion is presented in the second part of this annual evaluation, as required in the State/EPA Primacy memorandum of agreement between our agencies. The state program met or exceeded most reporting and targeted field activities within the annual State UIC grant workplan, despite remaining barriers from the pandemic.

**FY22 UIC GRANT END-OF-YEAR ACCOMPLISHMENTS:**

FY22 State and Tribal Assistance Grant (STAG Funding) -The federal FY22 grant allotment for the State of Louisiana's UIC program administered by the OC was \$367,000 in UIC programmatic funds. This allotment was awarded as the annual grant to OC during FY22. The OC also received \$34,400 in UIC Special Project funds during FY22. These UIC Special Project funds are in addition to the UIC programmatic funds. The total federal amount awarded to the LDNR UIC FY22 grant was \$401,400.

Workplan Deliverables-Table 1 identifies State program updates and other deliverables submitted pursuant to the FY22 STAG UIC grant work plan. IMD staff submitted all deliverables as mandated in the above referenced workplan. In addition, Table 2 shows the degree of accomplishment for selected program activities targeted in the FY22 UIC grant work plan.

LDNR's metrics for the planned and actual number of mechanical integrity test (MIT) inspections of Class II wells were impacted by: (1) changing the way they counted Part I and Part II MITs based on clarification emails from EPA, and (2) transitioning from the COVID-19 shutdown, which discouraged face-to-face interactions and hindered inspections that required the operator to be present.

LDNR was still able to achieve a greater-than-planned number of Class I Part 1 and 2 MITs, Class II routine well inspections, Class II compliance reviews, and Class III well inspections.

Quality Assurance Annual Update-Pursuant to regulatory requirements and policies of EPA, all environmental programs conducted on behalf of EPA will establish and implement effective quality systems. The Quality Management Plan (QMP) must be updated annually, and the Quality Assurance Project Plan (QAPP) must be updated at least every three years. If both the QMP and QAPP are current and valid, EPA requires each state to annually certify that both plans are current by submitting updated signatory pages and organizational charts as applicable. As part of the FY22 STAG UIC grant work plan, OC staff committed to submit to EPA Region 6 annual quality assurance certifications and new signatory pages before the expiration dates. The FY2023 QMP was approved on 7/15/2022 and expires on 7/15/2023. The FY22 UIC QAPP was approved on 1/05/2022 and expires on 04/14/2023.

**Table 1. Grant deliverables in FY22 UIC Workplan.**

Grant Deliverable	Due Date	Date Received
Quarterly Reports (EPA Forms 7520)	2Q: 4/30/2022 4Q: 10/31/2022	2Q: 6/06/2022 4Q: 11/22/2022
FY22 Grant Application FY22 Grant Workplan	Both were due on 5/01/2021 (60 days before the start of the grant on 7/01/2021)	FY2022 Application Received: 4/30/2021 FY2022 Application Approved: 8/04/2021 – after several minor revisions FY2022 Workplan Received: 4/30/2021 FY2022 Workplan Approved: 8/04/2021 – after several minor revisions
Final Financial Status Report (FY22)	11/30/2022 (90 days after the expiration of the grant on 8/31/2022)	The Final Financial Status report was received on 1/13/2023.
Annual UIC Program Report	11/30/2022	3/27/2023
Update on Program, Regulatory, or Statutory Changes	11/30/2022	3/27/2023
Annual QMP/QAPP Updates*	FY2023 QMP: 7/15/2022  FY2022 UIC QAPP: 12/30/2021	Received: 06/30/2022 Approved: 7/15/2022 Expires: 7/15/2023  Received: 12/30/2021 Approved: 1/05/2022 Expired: 04/14/2023
UIC Well Inventory for FY22	Suggested: 11/15/2022 Final (HQ approved): 1/01/2023	Submitted: 11/22/2023 Final (HQ approved): 2/01/2023

\*The Quality Management Plan (QMP) and Quality Assurance Project Plan (QAPP) are updated annually for tracking any program modifications, concurrences, and/or organizational changes.

**Table 2. FY22 Work plan target and end-of-year accomplishments program activities and end-of-year level of accomplishment for grant related activities.**

	ROUTINE WELL INSPECTIONS		OC/IMD WITNESSED MITs		PARTS I & II MECHANICAL INTEGRITY TESTS		COMPLIANCE REVIEWS ‡	
WELL CLASS	Target Value	Actual Value	Target Value	Actual Value	Target Value	Actual Value	Target Value	Actual Value
I	85	73	85	78	35	40	40	73
II (SWD & ER)	2,500	3,362	1,300	965*	800	553*	500	1158
II (Storage)	50	88	Not Applicable †		30	43	40	100
III	25	29	Not Applicable †		18	9	40	72
VI	Unknown	No Wells Exist	Unknown	No Wells Exist	Unknown	No Wells Exist	Unknown	No Wells Exist

\* Differences from predicted values and prior years reporting may be the result of (1) redefining the categories based on clarification emails from EPA. The number of wells listed are those wells that had both a Part I and Part II MIT in the reporting timeframe, and (2) transitioning from the COVID-19 shutdown, which discouraged face-to-face interactions. Note that the numbers of routine well inspections increased, where the operator presence is not required.

† Tests on salt caverns occur over several days, making witnessing by OC personnel impractical. Test data recorded continuously with the data submitted to OC for review.

‡ In-house review of well file by OC personnel ensuring compliance with permit or regulations.

**STATE CLASS VI PRIMACY:** During FY 2012, LDNR began work to promulgate the Federal regulations for subsurface geologic sequestration of carbon dioxide (CO<sub>2</sub>) published in the December 10, 2010, Federal Register at 75 FR 77230-77303. After temporarily halting in July 2012 due to diversion of state UIC program resources being diverted to address the sinkhole issue at Bayou Corne, work on obtaining primacy for Class VI carbon sequestration wells resumed in September 2019. A draft state Class VI rule along with a crosswalk comparing the state's draft rule to the federal rule was prepared and forwarded to the USEPA for review and comment in March 2020 with the aim of promulgating the state rule in the 4th quarter of 2021. Minor changes were made to the draft rule, and EPA gave consent to proceed with the final state rule promulgation. Recently, upgraded tax credit incentives through the 45Q rule have renewed interest in CO<sub>2</sub> sequestration. The OC IMD has formed a committee with EPA Headquarters, EPA Region 6, and the Louisiana UIC program to work through the process of obtaining Class VI primacy. LDNR updated the crosswalk and submitted it to EPA R6 and HQ on April 2, 2020. A coordinated review was conducted with the EPA Office of Water/Office of Ground Water and Drinking Water (OW/OGWDW), and programmatic comments were submitted back to LDNR on June 3, 2020.

In October 2020, LDNR completed Phase I (pre-application) of the Class VI primacy process, and the legal review of the crosswalk by EPA was completed. In January 2021, for Phase II of the Class VI primacy process, LDNR submitted to EPA the draft program description, the draft Memorandum of Agreement (MOA) Addendum modifying their existing UIC program by adding Class VI authority, and full documentation of their public participation process per 40 CFR §145.31(b). The state rule was published in the Louisiana Register on January 20, 2021. On April 21, 2021, LDNR officially submitted their Class VI Primacy package to EPA Region 6. This package includes the program description, the signed Attorney General's Statement, the signed Modified MOA Addendum, the signed modified Governor's letter, electronic copies of all applicable State statutes and regulations, the completed crosswalk, and documentation of the public participation process per 40 CFR §145.31(b).

On May 7, 2021, EPA completed its review, and sent back the program description and the MOA addendum for revisions, most notably in the public participation requirements. On May 28, 2021, Louisiana Department of Natural Resources (LDNR) published legal notices of the primacy application and an upcoming July 6 hearing in a number of newspapers across the state and distributed the relevant information to their Class VI interested parties list. On July 6, a member of R6 UIC traveled to Baton Rouge, LA to attend this hearing. Due to high public interest, LDNR extended the public comment period to July 13, 2021.

On July 14, 2021 EPA R6 and OW met with LDNR to discuss the outcome of their Class VI Primacy public comment period. LDNR reported that they received 25 documents with multiple comments each. On September 17, 2021, LDNR resubmitted their revised Class VI primacy application to EPA, including a revised program description, revised MOA, and complete documentation of their public hearing process. R6 UIC reviewed the revised LDNR Class VI primacy application and determined it complete.

The EPA R6 Regional Administrator's signature is needed to transmit the primacy revision application package to OW for action. If they deem the application approvable, EPA HQ would initiate the rulemaking phase, and simultaneously publish a notice of receipt of a complete application and proposed approval of the state program revision along with regulation text for Part 147. Notice of receipt of a complete application and proposed approval of the state program revision along with regulation text for Part 147. The revised MOA and OW transmittal memo were signed by the Regional Administrator's on May 11, 2022 and sent to the Office of Water.

The reviewing process thus moved to Phase III – Application Evaluation phase whose activities include program revision review, public hearings, and reviewing public comments. EPA-OECA began reviewing the package and brought up some comments for LDNR to address at the end of FY22.

**CLASS VI CARBON SEQUESTRATION PROJECT INTEREST:** By end of August 2022, no fewer than twenty entities have contacted EPA about Class VI interest in Louisiana, with ten partial to complete Class VI applications submitted to R6 UIC. LDNR and EPA continues to coordinate and collaborate on Louisiana Class VI interest.

**STATE UIC PROGRAM REVISIONS:** The following program, regulatory, and statutory changes in the Louisiana UIC Program took place during State Fiscal Year 2022:

- a) LA R.S. 30:23 was amended to add underground storage of hydrogen, ammonia, nitrogen, compressed air, and the noble gases to the previously listed hydrocarbons and carbon dioxide.
- b) LA R.S. 30:1103 and 1104 were amended to allow the commissioner of conservation to hold confidential any information that EPA deems to be Confidential Business Information in the same manner and to the same extents as the EPA.
- c) LA R.S. 30:1110 was amended to allow the commissioner to charge a fee that does not exceed the actual or anticipated cost to the state for the review of the permit or application. The statute was also revised to remove the \$750,000 cap allowed for administration of the program.

These statutory changes became effective on August 1, 2021.

**CORNERSTONE WASTE MIXING ISSUE:** Over the last few years, LDNR and EPA have communicated ongoing concerns with Cornerstone Chemical Company's current UIC hazardous waste injection operation. LDNR and EPA have discussed these concerns with Cornerstone in multiple conference calls and meetings, and by email. Chief among LDNR and EPA's concerns relates to the co-injection of acid and base waste streams in several of their wells by injecting the acid waste stream down the inner fiberglass tubing and injecting the base waste stream down the annulus of the fiberglass tubing and the steel tubing. This creates mixing and chemical reactions of the waste streams in the lower wellbore prior to the waste exiting into the injection interval. Cornerstone did not disclose this practice of waste stream mixing in either their existing or proposed petition reissuances.

Cornerstone's mixing of incompatible hazardous wastes in its injection wells has created long-term problems with maintaining injection well integrity and uncertainty about the technical adequacy of its no migration petition demonstration. Cornerstone has experienced repeated loss of mechanical integrity in all five of its injection wells, primarily due to casing leaks over the last three decades, which appear attributable to incompatible waste stream mixing and exothermic reactions.

Cornerstone's current no migration petition expired on June 30, 2016. They operate under administrative continuance while EPA reviews their no migration petition renewal application and their responses to EPA concerns. LDNR and EPA have been in discussions with Cornerstone since 2016 on the above issues, with LDNR issuing a compliance order on May 19, 2017, requiring Cornerstone to submit a workplan to investigate whether contaminants of concern have been released to groundwater. On June 24, 2020, EPA sent a letter to Cornerstone Chemical Co. requesting information in response to EPA petition reissuance concerns. LDNR sent a Notice of Deficiency (NOD) to Cornerstone, dated June 24, 2020, addressing many of the same issues as permit deficiencies. EPA Region 6 Underground Injection Control (R6 UIC) utilized expertise of the EPA Office of Research and Development (ORD) to analyze Cornerstone's injection waste stream mixing and analysis plan. In addition, EPA Region 6 had consulted with LDNR on Cornerstone's responses to both agencies. LDNR and EPA did not believe that Cornerstone's responses and submitted documentation sufficiently address LDNR and EPA's concerns outlined in the June 24, 2020, letters, primarily centered on Cornerstone's waste disposal practices, injection well integrity, and fate of injected hazardous wastes in the subsurface.

Cornerstone's waste stream mixing analysis, part of its response to LDNR and EPA, indicated the formation of gas-phase reaction products, including hydrogen cyanide, methane, carbon monoxide, carbon dioxide and ammonia. Exothermic reactions of basic and very acidic waste streams in the injector wellbores have possibly

led to thermal stress and corrosion on wellbore mechanical components, unknown constituents entering the injection interval, and the possibility of a two-phase waste (hazardous gas and liquid) plume not accounted for in its no migration petition. The formation reaction product gases (HCN, ammonia, CO, methane, and CO<sub>2</sub>) pose a risk of exiting the injection zone through strata, well mechanical integrity failures, abandoned wells, and/or up-dip movement of a possible hazardous gas phase buoyant plume. Louis Armstrong New Orleans International Airport is located structurally up dip from the facility and across the Mississippi River to the north, in the presumed path of a buoyant gas-phase plume. In addition, there are environmental justice considerations. Minority, disadvantaged, and overburdened communities live in the site vicinity and up dip of the potential plume.

On February 16, 2021, LDNR and EPA each issued an NOD to Cornerstone requiring a workplan with a timeline for groundwater and two-phase plume assessment. Cornerstone's NOD response was due sixty days later on April 16, 2021. On April 9, 2021, Cornerstone submitted a "preliminary" response which was deemed inadequate by both LDNR and EPA. Cornerstone was given three weeks from April 28, 2021, to formulate a detailed workplan with timeline. On May 18, 2021, Cornerstone submitted a supplemental response to the NOD, with an updated project Gantt chart that included a revised and updated timeline to complete key activities for the injection wells at their site. IMD and EPA, after reviewing the response both internally and together, decided the response was deemed an improvement on the original response, although concerns still existed mainly over the installations of monitoring wells, the list of analytes, and sampling/logging of the well.

During the weeks of the May 31 and June 7, Cornerstone sent LDNR and EPA multiple packages containing plume and groundwater assessment workplans. LDNR and EPA agreed that the workplans were an improvement on Cornerstone's previous responses and presented a good faith effort on Cornerstone's behalf. Based on their feedback, Cornerstone identified some offsite wells and a list of more than 60 analytes for sampling, with a focus on volatile constituents that could be present in a buoyant mixed phase (liquid and gas) plume.

In addition to monthly technical meetings, Cornerstone sends progress reports and Gantt charts every sixty days to LDNR and EPA, as mandated by the NOD. LDNR IMD and EPA continue to communicate frequently and collaborate effectively on Cornerstone's ongoing NOD response.

**GALATA CHEMICALS HAZARDOUS WASTE INJECTION:** Galata Chemicals operates a non-hazardous injection well in Hahnville, just outside New Orleans. The well was previously owned by Witco, and Galata's current practice is to separate hazardous materials from their non-hazardous waste stream by settling out the hazardous material through gravity in an above ground tank, scooping out the solids, then injecting that "non-hazardous waste stream" (in quotation marks) down the well. Quarterly report indicated multiple pH exceedances, leading to an investigation and eventually a raid in April by LDEQ, EPA, and Louisiana state police.

On December 7, 2021, LDNR IMD, EPA R6 UIC, LDEQ RCRA, and EPA RCRA decided that LDNR would send an information request letter to Galata for casing inspection logs and additional testing of the injection well, and a notice of deficiency requiring Galata to re-permit their injection operation from nonhazardous to hazardous, which would effectively require Galata to submit a Class I non-migration petition and bring in EPA jurisdiction.

In April, LDEQ, EPA, and Louisiana state police raided their facility and Galata was placed under criminal investigation for injecting hazardous waste in their non-hazardous operation.

**EAGLE US 2 SULFUR MINES:** Boardwalk and Eagle operate active solution mining and gas and LNG storage at the Sulphur Mines Dome salt caverns, located in southwest Louisiana. In late December 2021, several of the storage caverns experienced a drop in pressure and a producing well experienced a drop in production,

signaling a possible instability event at the dome. In addition, there is leaking gas from cavern PPG 2A, which could be from a failed P-seal. The source of the gas is being investigated.

On February 22, 2022, the operators and consultant presented their investigation approach, which include 3D sonar mapping of the caverns; monitoring of clearance between caverns and the dome flanks; study of differential pressures in the caverns over time; mechanical integrity testing of wells (temperature, pulsed neutron, and thru-tubing casing inspection logs); and a subsidence survey. Geophone arrays would be installed to monitor microearthquake activity. LDNR issued Administrative Orders and work permits to complete all work. Regular monthly update meetings started from this point.

In one of the caverns, there are two areas experiencing progressive salt shelf collapse, and accumulation of fill material at the base of the cavern. One of the collapse events occurred around March 23, 2022, and could be due to the late 2021 pressure drop event. The salt shelf collapse events are not extensive and do not appear to impact cavern integrity; there are no indications of dome or flank collapse.

On June 13, 2022, Lonquist shared their plan for monitoring seismic activity by placing two analog geophone arrays in the production casing on two inactive cavern wellbore entries. Magnitude sensitivity modeling suggests the network can detect magnitude  $>-1.5$  throughout the dome. Their location uncertainty modeling suggests the geophones should provide microseismic monitoring coverage over the entire Sulphur Mines salt dome. Monitoring began FY23.

**PERSONNEL ACTIVITIES:** IMD hired two administrative staff and nine new technical staff. They had one promotion in their technical staff, two resignations in their technical staff, and two resignations in their administrative staff. Matt Aranyosi was promoted to Petroleum Scientist Manager in the Engineering Section effective May 30, 2022. Gwendolyn Kirby (WAE Administrative) resigned effective January 28, 2022; Kellie McNamara (Petroleum Scientist Manager) resigned effective February 27, 2022; Brian Barbera (Petroleum Scientist 3) resigned effective March 20, 2022; and Pamela (Joy) Berryhill (Administrative Program Specialist) resigned effective May 22, 2022.

IMD has a highly technical division that requires certain skill sets which are not easily replaced. They continue to do an outstanding job of trying to maintain the knowledge level in the division. In addition, it is important for IMD to maintain staffing levels at or near “full” levels to accommodate the workload; their early year hiring successes in bringing on technical staff show that they are keeping up well.

**CONCLUSION:** LDNR IMD continues to do outstanding work in administering the UIC program. They have embraced a proactive approach to the regulated community in Louisiana, addressing various regulatory and technical issues such as the Cornerstone waste mixing issue, Galata hazardous waste injection operation, and Sulfur Mines monitoring situation. They have been engaged with EPA through the primacy application process and responsive to our requests for information. IMD Director Steve Lee has developed a team of technically adept individuals that continues to grow their capacity on his team, and his staff also does an excellent job of engaging the Region 6 UIC staff on areas of concern. As interest in Class VI carbon sequestration projects grow, LDNR and EPA continue to maintain solid coordination and collaboration with each other.

LDNR’s metrics for the planned and actual number of mechanical integrity test (MIT) inspections of Class II wells were impacted by: (1) changing the way they counted Part I and Part II MITs based on clarification emails from EPA, and (2) transitioning from the COVID-19 shutdown, which discouraged face-to-face interactions and hindered inspections that required the operator to be present.

LDNR was still able to achieve a greater-than-planned number of Class I Part 1 and 2 MITs, Class II routine well inspections, Class II compliance reviews, and Class III well inspections. LDNR did an outstanding job navigating issues while transitioning from the barriers presented by the COVID-19 pandemic.